



System Engineering Analysis
For the
City of Peoria
Traffic Management Center
(ADOT Alternate Traffic Operations Center)

ADOT Project # CM-PEO-0(202)A
ADOT Tracs # SS670 01C

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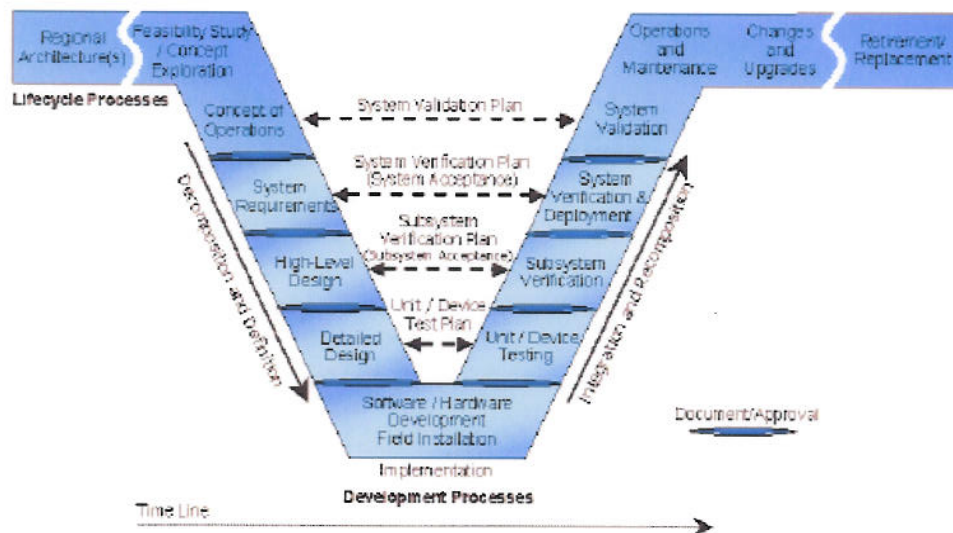
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1. Executive Summary:

1.1 Introduction:

FHWA funding requirements require that agency ITS projects using federal money prepare a system engineering analysis for their project. This report has been prepared for submittal as the City of Peoria, Az. is using federal grant monies for the implementation of a Traffic Management Center (TMC). The report describes how current and future programming efforts are mapped directly to the System Engineering Analysis process defined in the following diagram:



1.2 Project Background:

The City of Peoria, Az. is a member of the AZTech™ Model Deployment Initiative (MDI). The AZTech™ MDI began 10 years ago through federal funding. When the Grant Monies ended, the member of the AZTech™ Model Deployment continued to work together on ITS issues. The City of Peoria, has long been a member of the AZTech group, and regularly participates in the AZTech Executive Committee, The AZTech Operations Committee, The AZTech Advance Traveler Information Committee, and the AZTech TMC Operators Working Group.

The City of Peoria installed a Computerized Traffic Signal System in 2006, and has installed a fiber optics communications backbone network for communications. The City is in process launching a hybrid wireless/fiber project to connect many of the City's Traffic Signals to the backbone. The City has 85 traffic signals, one Closed Circuit Television (CCTV) Camera and two Dynamic Message Signs (DMS) installed

at the time of this report and plans to add 7 CCTV Cameras, and 4 portable DMS. The City recently created a new position (Traffic Signal System Specialist) to ensure that the new equipment would be properly used to manage daily traffic, incidents on the City Arterials and mitigate traffic congestion.

The City has agreed to share their TMC with the Arizona Department of Transportation (ADOT) as the Alternate Traffic Operation Center (ATOC). The location of the proposed City's TMC is ideal for the ATOC because it is close to the freeway, and it is a newly constructed facility that was designed to add the required space for joint use.

2. Regional Architecture:

The planning for the TMC includes the methods of communications. The Design for the TMC follows the AZTech guidelines and inter-jurisdictional exchange of information. The City plans to follow all AZTech guidelines, and policies for the operation and data sharing of the TMC.

In 2000, the Maricopa Association of Governments (MAG) developed the MAG Intelligent Transportation Systems (ITS) Strategic Plan Update Report which included Technical Memorandum No.5 – MAG Regional ITS Architecture. Section 5.3 (Recommended Future MAG ITS Physical Architecture) of the MAG Regional ITS Architecture states “Technical Memorandum No.7 – ITS Telecommunications Plan, will describe in greater detail the types of communications infrastructure that must be deployed in order to achieve the MAG regional architecture vision.”

3. Feasibility Study:

Links between agencies were established in 1998 as part of the AZTech™ MDI, a project that was funded in part by a Federal Highway Administration (FHWA) grant. AZTech™ has since become a voluntary coalition charged with responsibility for regional ITS operations. AZTech™ now relies on the coordinated efforts of local, county, and state agencies to maintain and expand the telecommunications network that was deployed in the MDI.

The *MAG ITS Strategic Plan Update (2000)* outlined a path of migration from leased lines to a regional fiber optic network. As part of the MAG ITS Strategic Plan Update report Technical Memorandum No.7 – ITS Telecommunications Plan was developed to explore the concept of how the various agencies were going to interconnect their communications infrastructures into a common communications infrastructure to achieve network connectivity between partnering agencies. In Section 3 – ITS Telecommunications Needs of Technical Memorandum No.7 – ITS Telecommunications Plan it states: “The ultimate goal of the communications

infrastructure is to have all agencies interconnected via the regional fiber optic network with both data and multiple video communications channels”.

The City of Peoria is amongst the first jurisdictions to be connected to the RCN. The City has installed a fiber backbone to connect field devices to the central system, hired staffing for the operation of the system, and designed a 2,600 square feet TMC in the new Development and Community Services Building.

4. Concept of Operations:

The City of Peoria is to participating in the regional operations of traffic management, and intends to be more active in regional operation in the future. The City is actively involved in the operation or regional operations. The City is following the MAG Regional Concept of Transportation Operations, January 7, 2004.

5. High-Level Requirements:

The City of Peoria, Az. is completing the construction of a new Development and Community Services Building. As a portion of the design of this building, space was set aside for the construction of a state of the art TMC. There is 2,600 Square Feet of space dedicated for this use. ADOT will have dedicated office space within the TMC, and shared space for the entire TMC. The TMC project will provide a video wall, and additional flat panel screens for surveillance, a server room to house all of the servers required for the operations of the TMC / ATOC. A Keyboard, Video, and Mouse (KVM) switch enables operators to switch between servers and workstations as needed. Sufficient workstations will be provided to allow ADOT and City operators to manage their respective traffic areas and perform their normal work. A Video Conferencing system will be installed to allow the operators in the Peoria TMC to communicate directly with other TMCs throughout the Valley. CCTV camera control and TSM (Traffic Signal Management) will be performed with systems already in place at the City of Peoria, Az. Regional communications will be provided through a TMC Firewall and Demilitarized Zone (DMZ) Server to ensure that other agencies can easily access information. An ITS Lab will be available to test new equipment and set up field equipment prior to installation in the field.

6. Detailed Requirements:

- 6.1.1 Video Display: The Video Display for the TMC will include approximately 18,000 square inches of Video Wall, and 4 Liquid Crystal Display (LCD) screens adjacent to the video wall. The design will determine the appropriate technology for the Video Display, including the appropriate type of processor. The Video Wall and the LCD Screens will be accessible through the KVM

and will be assignable to various pc connections to allow independent display on each.

- 6.1.2 KVM Switch: The KVM switch will allow hard wired connection to all devices in the TMC as well as operator access remotely into the system from locations outside of the TMC.
- 6.1.3 Workstations already in use by the city will be relocated to the new TMC, and additional 4 new workstations will be purchased and installed. All workstations will be Dell701 or similar with flat panel monitors and Windows Office Suite, I2, Camera Chameleon, and Econlite AutoScope Suite. All Software shall be configured to the current City of Peoria standards, and fully operations at all workstations when accepted. The TMC shall have a color Laser printer and a color plotter configured to the Traffic Network for allowing printing off of the Traffic Network and the ADOT installed infrastructure.
- 6.1.4 Servers already in use by the Traffic Network, will be relocated into the TMC server room including the fiber connections. New servers for the TMC will be included in the project, and will include at a minimum, and Auto Scope Server, A Video Conferencing Server, A DMZ Server.
- 6.1.5 A Firewall shall be installed and configured to allow the DMZ server to control the communications between the City of Peoria and other jurisdictions. The firewall configuration shall allow passworded accounts to penetrate the firewall to access information from the traffic network. All access through the firewall will require password access through the DMZ server. The firewall shall also allow the City to post to the DMZ server, and have free access to the information so posted from the outside.
- 6.1.6 CCTV Camera control will be primarily through the Camera Chameleon product by 360 Surveillance. There is one server and one workstation for this system that will require moving. This product is on a statewide license and is a legacy software to the City of Peoria.
- 6.1.7 TSM software is currently provided by Siemens ITS and is I2. This software provides the City with real time traffic management and information for the Signal System. There are 3 servers and 3 workstations that will be relocated with this project.
- 6.1.8 ITS Lab will be provided for the testing, calibration and setup of ITS equipment for the City of Peoria. The lab will consist of a workbench, a Traffic Signal Cabinet, controller, MMU, and assorted equipment that will allow the lab to simulate an intersection on the system, and test equipment. In addition, the lab will allow the ITS personnel to configure switches, codec's, CCTV, and other units in the TMC prior to installation in the field. The lab shall also be capable of connecting to the regional network for testing purposes.
- 6.1.9 System integration will combine all 8 tasks above to provide a seamless operation for the TMC, allowing the operators to access data from all systems and use full functionality to manage traffic.
- 6.1.10 Testing and System Acceptance, the system will be tested for 30 days after all systems are turned on. If after 30 days, no central system failures have

occurred, the project will be accepted. If there are system failure, the testing will recommence and another 30 day period will apply until the system function normally for 30 continuous days.

- 6.1.11 Documentation will include all operating manuals, operators manuals for all new equipment installed. "As-Built" system architecture block diagrams, and plans,

7.0 Software, Hardware Development, Field Installation

Software, Hardware and Field installation of equipment will completed through RFP solicitation for construction. The Construction will be based upon detailed construction plans developed by Lee Engineering in a separate project paid for by the City of Peoria.

8.0 Unit/ Device Testing

The contractor will be responsible for testing all units/devices in the TMC Pre and post installation. All devices will be tested by the contractor to ensure that they meet manufacturer's guidelines, and the requirements of the bid specifications, with a report to the City on each device with test results. Test Reports must be completed prior to any subsystem testing or validation.

9.0 Subsystem Verification:

The contractor shall be responsible for the development of a plan to verify all subsystems function appropriately and interface with other systems in the TMC.

10.0 System Verification and Deployment:

When all subsystems have been tested and verified, the contractor will integrate all of the systems into a fully functional unit. The system deployed will be required to meet or exceed all of the expectations as described in Section 5 above. When the contractor is assured that all subsystems are fully operational in the one system, validation may begin.

11.0 System Validation:

System Validation will begin when the contractor assures the City that all subsystems are functioning and that the entire system is ready for operations. At that point, the City will begin testing to ensure that the system is working

correctly. If the system functions without failure for 30 working days, the City will accept the project.

12.0 Operations and Maintenance:

The City will staff and operate the TMC for functional hours Monday through Friday. The Staff will perform all operational functions, and minor maintenance. Maintenance Agreements will be procured for all major equipment within the TMC to ensure that all major equipment will be protected against a major failure.

13.0 Changes and Upgrades:

The City of Peoria will be responsible for upgrades to system and subsystem devices, as well as software installed in this project.

14.0 Retirement/Replacement

The City understands that most of the equipment in this project has a useful life expectancy of approximately 5 years, and will need to be upgraded / replaced in approximately that timeframe. The City will plan for those expenditures for the appropriate budget years.